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MODIS QUARTERLY REPORT
JULY - SEPTEMBER, 1994

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RSMAS/MPO

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Due to the interlocking nature of a number of projects, this and subsequent reports will contain coding to reflect the funding source. Modis funded activities are designated with an M, SeaWIFS with an S, and Pathfinder with a P. There are several major sections within this report; Database, client/server, matchup database, and DSP support.

A. NEAR TERM OBJECTIVES

A.1 Modis Objectives (M)
A.1.1. Continue to develop and expand the processing environment
a. increase computational efficiency through concurrent operations
b. determine and apply more efficient methods of data availability for processes
A.1.2. Begin extensive testing using global CZCS and AVHRR GAC data with database processing to test the following:
a. algorithm capability
b. machine and operating system stability c. functionality required for the processing and analysis environment

A.2 SeaWIFS Objectives (S)
A.2.1. Continue testing of processing methodology. A.2.2. Continue to develop relationship between database and in- situ environment.

A.3 Pathfinder Objectives (P)
A.3.1. Expand matchup database as applicable. A.3.2. Continue testing of methodology.
A.3.3 Train and integrate new personnel into Matchup Database processing scheme.

A.4 DSP Objectives (M)
A.4.1. Continue testing of processing methodology. A.4.2. Continue to expand the number of sites supported. A.4.3. Expand the supported hardware/software platforms

B. OVERVIEW OF CURRENT PROGRESS

B.1 Automatic Processing Database (P)

B.1.1 Operational Testing

B1.1.1 July Operational Processing

Product production was completed on weeks 29-51 of 1987.

B.1.1.2 August Operational Processing

The operational processing responsibility was assumed by Dalu Li. Most of August, he concentrated on the processing through the production of the daily files, then assumed control of the weekly, post-processing jobs near the end of the month.

The end of the NOAA-9 data (weeks 8844-45) was reprocessed. It was discovered that some NOAA-11 passes had inadvertently been processed with the NOAA-9 data. Processing then proceeded with NOAA-11 data starting with week 8845. Weeks 8845-8916 where processed and product production completed for weeks 8845-8908.

B.1.1.3 September Operational Processing

Weeks 8917-8937 were processed and product production completed for weeks 8909-8924.

Visitors
On 12-16 Sept., three visitors from the US Naval Oceanographic Office visited RSMAS to discuss AVHRR/Pathfinder Processing.

B.1.2 July - September Development

A number of major revisions in the server system were under development during this three-month period; the resulting system is still in the testing phase. Except for a brief test period in early September, the more stable, operational system was used to run the processing, and will continue to be used until the new system has been verified.

Changes to login.com - create ap_comfig.com and ap_build.com. There will be one file (ap_comfig) to define the disks, and then the directories will just follow that.

Changes to dir.defs - make BDISK, LDISK, etc., for the processing machines. Define all the GACSST, GACPST, etc. at once. Create a set of environmental variables defining which server is to be used, and which types of jobs are to be run.

Eliminate explicit site references in the server software.

Eliminate remaining explicit directory references, substituting logical definitions (VMS) and environmental variables (Unix).

Change some directory references from general directories to directories for individual servers at the same site. For example, ADDRECGAC writes a data transfer file to a temporary directory, previously defined as the logical ap_tmp. However, when two servers are run at the same site, these transfer files could be used by the wrong server. So, subdirectories were used, and pointed to by a new logical, ap_srvr_tmp. This was done in several cases.

The method used to trigger the daily and weekly jobs is being modified significantly. In the new scheme, each time an orbit is completed, the database will check to see if all orbits for that day, the previous day and the succeeding day have been processed. If so, the daily job will be triggered. Similar trigging for the weekly job is now used.

The mcp program that ran various jobs had previously been distinguished by appending the job type to the executable name (e.g. the mcp that ran "initial" jobs were named mcp-i). An alias was developed to eliminate the need for the extension. Further, a large set of command files that had been used to start various jobs on various computers was replaced by a single command file that parses input parameters to determine which jobs are to be run.

A mechanism has been added to assign all weekly jobs to the single "workhorse" computer when records are added. Another mechanism queries the environment, and if requested, assigns the weekly3 jobs to the "local" computers that service the volume disks. This variable will be set to true for RSMAS, and false for JPL, as they do everything on one machine.

Two new jobs were added to the database records for future use, but have not yet been implemented or tested. One post-processing job and numerous backups are performed in increments of 2-8 weeks. These new jobs will run on four and eight-week increments of the data.

The changes made during the previous two months were tested, but problems still exist, so the processing was returned to the older system. There are also problems with multinet connections between client computers and the Alpha/OpenVMS server system. When these have been cured, the new APServer system will be tested.

B.2 Client/Server Status (S)

B.2.1 3rd Quarter Client/Server Development

The following is basically what was accomplished for the 3rd quarter concerning Client/Server processing:

1. A graphic user interface for ap was completed. 2. An interface frame between ECS PGS Toolkit and DSP was written. The frame

contains the interface that allows DSP functions to call basic PGS Toolkit I/O functions.
3. The new version of VDC was rebuilt.
4. A portion of the 1989 AVHRR data was processed.

B.3 Matchup Database (P)

B.3.1 3rd Quarter Matchup Database

During this quarter we continued extending the temporal coverage of the matchup databases. We completed extraction of NOAA-11 AVHRR/GAC data for 1992 and we produced the corresponding global matchup data set for that year. All the available in situ SST observations for 1993 were prepared for the extraction of GAC data. This effort is currently in progress. We are still awaiting 1993 data from the moored buoys operated by the Japanese Meteorological Agency (JMA). Although we sent two written requests to JMA, we have not received any response.

Further during this quarter, we continued with the addition of atmospheric water vapor estimates to the matchup databases. Water vapor concentrations were derived from data collected by the Special Sensor Microwave/Imager (SSM/I). Data tapes with SSM/I-derived geophysical values (water vapor, wind speed, precipitation rate) had been obtained from the Physical Oceanography DAAC at NASA’s Jet Propulsion Laboratory.

The addition of water vapor estimates to the matchup databases involves two steps: the first one is the generation of global water vapor fields, and the second step is the extraction of water vapor values at the locations/times of the existing matchups. To produce global water vapor daily fields, the following steps were followed. First, we built global “superobservation” gridded files using a block median filter and a grid spacing of 0.5° x 0.5°. This reduced substantially the volume of data to be processed subsequently.

B.3.2 Associations between SSM/I-derived water vapor and AVHRR quantities

During this quarter a significant amount of effort was devoted to an exploration of associations between SSM/I-derived integrated water vapor values (henceforth referred to as WV) and various AVHRR quantities related to SST estimation.

The temperature deficit (defined as the difference between the in situ SST and the brightness temperature for AVHRR channel 4) can be used as an indication of how much atmospheric correction is required for the satellite data. We investigated associations between the temperature deficit and (a) WV values and (b) the difference between brightness temperatures in AVHRR channels 4 and 5 (T4 minus T5, or T45). Our results showed that T45 shows a tighter association with the temperature deficit than the WV. This is probably because the SSM/I WV values are integrated values that

do not contain information about the vertical arrangement of temperature and moisture in the atmosphere.

We also used a radiative transfer model developed at the Rutherford-Appleton Laboratory (RAL) in the United Kingdom. The RAL model provided significant insight into the associations being examined with the SSM/I-AVHRR matchups. For instance, the matchups showed some points with unusual characteristics: low T45 values together with high WVs (normally one would expect both quantities to be directly correlated). Examination of radiosonde profiles and the corresponding simulated AVHRR brightness temperatures showed that these situations corresponded to temperature inversions in the atmosphere. As another example of the usefulness of the radiative transfer model, we learned that the proportion of radiance emitted by the ground sensed at the satellite decreases with increasing water vapor and zenith angle. At higher WVs, most of the sensed radiance is emitted by the atmosphere.

The analyses described above are being summarized in a manuscript currently in preparation. The manuscript will be submitted to a scientific journal before the end of 1994.

B.4 DSP Support (M)

B.4.1 Testing:
None listed

B.4.2 Modifications/Additions to DSP:
SSBIN-HDF: Add quality checking; use L3-Binfiles.v3.2 routines. Use v3.3 interface routines. (Still using tau band for flags.) Use HDFLIB from make.1. Take out unused include file: calibration.h. Comment out unused include files.
STBIN-HDF: Add quality checking; use L3-Binfiles.v3.2 routines. Take out debugs.
Use links instead of specific directories in makefile; put flags in tau band (instead of eps band).
SMAP9-HDF: Add quality checking; use L3-Binfiles.v3.2 routines; add output of flag bands.
Use v3.3 interface routines. (Still using tau band for flags.) Use HDFLIB from make.1; check for chlor_k490 before checking for chlor. ANLY8D: Add satellite zenith angle check. Make compatible with Read_Cal v3.1 distribution. Correct handling of ANCHOR$C to multi-resolution input files. Add support for V3.3 I/O spec.
Use symbols HDFLIB and HDFINC defined in etc./make.1. Add epsilon output value (byte).
Use calfixit to find ancillary data files. Change Carder Q from 5.9 to 3.42.
Disable La670 test in Cocco flag test.
Disable interpolation between scan lines pending decision on read ahead logic.
PATHNLC: Add checks for satellites and years. Allow NOAA-9 1987 and 1988; and NOAA-11 1989 through May 1991. OA2PST: Bin data from a binary oa file into a pathbin type pst file. LOADDB: New program to read history file listing of dbman output and populate netcdf

dbman files.
RTLIB: Include "rtlib.h".
COLORSHR8: Switch to using HDF 3.3r3p1 library. Add support for V3.3 I/O spec.
Remove references to HDF directories .. not needed. MIA2GIF: Remove palette number keyword. Add new keyword "PAL" that accepts palette file and palette number. If palette number is specified but not palette file, palette number refers to the input image file. Add code needed on big endian machines.
HDF: Add linux support.
MAKETC: Converted from adage system to Unix.

B.4.3 PROBLEMS FIXED:
DBMAN: Take out some debugs. Use all lower case letters in the database file names.
Fix a comment.
LOADNOHED: Add wait for last asynch write. PATHBIN: Take out debug statements when a bin number larger than 6000000 is calculated.
CLIP: Fix description of program to say bound instead of zero.
DSP: Change the name of the DSP function "stat" to "fstat". Add more string frees and two error messages. Remove definition of "INSTALL".
ADD: Don't bound bias; set in1 open flag properly. PALSAV: Remove RTLIB #defines, they are now in $DSPROOT/inc/rtlib.h PAL: Remove RTLIB #defines, they are now in $DSPROOT/inc/rtlib.h EXIST: Remove RTLIB #defines, they are now in $DSPROOT/inc/rtlib.h COLORSHR: COLORSUB.C: Remove some #defines, they are in rtlib.h now.
COLORSHR5: COLORSUB5.C: Remove some #defines, they are in rtlib.h now. COLORSHR7: COLORSUB7.C: Remove some #defines, they are in rtlib.h now. Add support for Anc-files v3.2.
Source sync tool.
Disable DEBUG flag included in distribution of v3.2. Add support for V3.3 I/O spec.
Use symbol HDFINC defined in etc/make.1. Check-Anc getanc.c makefile
Use calfixit to find ancillary data files. Fix calls to get_ancillary.
GETCOM: Remove #define's now in rtlib.h. MCSST: Remove #define's now in rtlib.h.
CALLER: Make a copy of the process name before removing '%'.
VMSLIB: STRINGS.L: Add linux support. RTLIB: STRINGS.H: Add linux support.
VMSFORLIB: ACCESS.C: Add linux support.
IO: CALIBRATION.C: Add linux support.
LOOP: Fix to allow up to 16 planes, and add option to specify just the number of planes to loop and the number of the first plane.
SHPSPH: Fix decodes to work on all machines. VHRR: Fix decodes to work on all machines. PALHST: Fix palhist to call iaccum1 correctly.
Fix some more decodes to use formats instead of *. TWOLINE2PPT7.C: Add error checking to grejul and julgre. Correct range check in julgre for selecting proper table entry. Disable debugging in makefile.
XFLOAT.C: Down-case the names of the functions xfloat and xfloati.

ORBIT: Use functions when mixing variable types, don't let compiler do it. MAKEPPT7: Fix makefile rule for unix.c. Disable debug options.
Remove unnecessary blank lines from output file. APP2PPT7: Disable debugging in makefile. PRINTPPT7: Disable debugging in makefile. PUTNLPPT7: Disable debugging in makefile.

B.5 Direct Project Support

B.5.1 SeaWIFS (S)
SeaWiFS
Aug. - received update for ancillary/calibration routines and merged into ANLY Level 2 code.
Updated Level 3 HDF routines merged into Level 3 BIN programs. Need to include routine for scan dependent calibration into ANLY. Received code from K. Carder for chlorophyll calculation. H. Gordon working on next generation atmospheric correction routine.

Discussed new atmospheric correction routine with H. Gordon; also Tau(865), Tau(all channels for Carder), at of band correction. Jim needs to merge new correction algorithm, READ CAL calibrate L1 routine, and new Carder algorithm into ANLY. September
Stray light correction for LAC (adjacent scan lines) needed. Jim to discuss ANLY status with Gene and Chuck while at GSFC. Seawifs engineering test flag defined by McClain, included in ANLY Carder routines combined into single package and integrated into ANLY. New L1 data files requested that are compatible with new HDF libraries.

B.5.2 MODIS (M)
MODIS
Participation in the Ad Hoc Working Group for Production (AdHWGP)
Develop AdHWGP quantities to submit to MODIS team Level 2 and Level 3 processing requirements essentially the same as contained in ATBD.
Produced short note on directions and potential costs for ATM networks.
Acquired FORTRAN 90 compiler, documentation and parallel system environment for DEC 2100 multiprocessor. Distributed to laboratory personnel for evaluation and experimentation. Received DEC DLT 5 terabyte tape jukebox, install on DEC 2100 processor together with Network Save and Restore software. Ordered raid disk array for DEC 2100.
September
Discussed acquisition and testing of MODIS cloud routine with P. Menzel. They will supply our group with code and test data by December.
Granule definition from A. Fleig - 2300 km (lon) by 1000 km (lat). files to cover same 10 deg zonal band for each day. Possible separate files per instrument channel.
Worked with Angela Li and E. Masuoka to transfer MODIS ocean team processing flow diagrams, processing requirement and data volumes.
EOSDIS Data Panel meeting with AdhWGP and Alternative Architecture

presentations.
Discussed use of R. Rood space/time interpolated data sets (DAO) for ancillary data in MODIS and Seawifs algorithms.
contact: Jim Stobie, DAO (code 910.3),stobie@dao.gsfc.nasa.gov

B.5.3 Pathfinder (P)
Pathfinder
August
Global daily SST maps for 1987 and 1988 distributed to D. Adamec.
Global PST files sent to JPL (A. Tran)
Discussed upcoming N14 (launch end of 94) and Noaa-K/AMSU with D. May to help define algorithm approach combining AVHRR channels with atmospheric sounder.
Requested N-14 thermal vacuum calibration tapes from S. Brown
Testing server migration from microVAX to Alpha implementation.
September
Using radiative transfer model to study at satellite radiance contributions by path and ground terms. These studies will be used to investigate alternative algorithms.
Telecon with JPL to discuss data quality definitions. Discussed Pathfinder data integrity with D. Adamec, will analyze seasonal cycle and compare with P. Cornillon cloud cleared fields. Test processing 1989 and 1990

B.6 Team Interactions

C. FUTURE ACTIVITIES

C.1 Database Future Work

C.2 Client/Server Future Work
Continue development of programs to support SeaWiFS in the VDC environment.

C.3 Pathfinder (P)
C.3.1 Continue development with 1 deg (360x180) spatial resolution maps produced by Dick Reynolds.
C.3.2 Continue algorithm tests and Pathfinder-Reynolds comparisons.

C.4 Modis (M)
C.4.1. Create tools to assist in result's interpolation. C.4.2. Verify workstation DSP (SGI, SUN, DECstation, VAXstation) by comparing each program's output with the Adage system. C.4.3. Use test data sets developed to continue test criteria. C.4.4 Continue ATBD exchanges and reviews.

C.5 SeaWIFS (S)
C.5.1 Continue testing of Gordon's algorithms and its interaction with HDF ancillary routines.
C.5.2 Continue timing tests with CZCS and SeaWiFS algorithms.

D. PROBLEMS

D.1 Database Problems

None listed separately

D.2 Client/Server Problems

None listed separately

D.3 Matchup Database Problems

None listed separately

D.4 DSP Related Problems

None listed separately